botany, which includes not only types of cryptogams, but also of phænogams. This is properly the biological laboratory so-called, and the cryptogamic laboratory is in an adjoining room, in which the large collection of thallophytes, together with an illustrative herbarium of higher cryptogams and phænogams, is deposited. In this room all the special cryptogamic work is done with collections and books at hand. During half of the college year general work on cryptogamic botany is taught at the laboratory in Harvard Hall. I am led to make this explanation lest some of your readers may otherwise infer that the botanists of Harvard believe in keeping cryptogamic botany distinct from phænogamic botany. The contrary is true, and no one would be allowed to take the courses in cryptogamic botany proper who had not previously passed a satisfactory examination in phænogams.

Cambridge, Mass. W. G. FARLOW.

CURRENT LITERATURE.

Revision of the Canadian Ranunculaceæ. By Geo. Lawson, Ph. D., LL.D. From Trans. Roy. Soc. Canada, ii, pp. 15–90. 4°. 1884.

In this extended paper on plants of a single order the author has treated very fully of the synonymy, description, geographical distribution and local occurrence of each species known to have been found in Canada. In instances where doubt exists respecting the validity of a species' claim to recognition, he has entered into a discussion of historical data in regard to it. This paper was preceded by a similar one published in 1870, and embodies the results of riper study, and the additional information secured through private collectors and the Canadian Survey. The extent of the labor involved in its preparation may be inferred from the fact that the index contains 418 different names of the plants embraced in the paper, of course including synonyms. The work will prove valuable to all students of the North American flora, and particularly so to those of Canada, for whom it is specially designed.

Dr. Lawson is author of a number of other botanical papers on the Canadian flora, especially in reference to several rare plants, including Calluna vulgaris, Sedum Rhodiola and others.

Manual of Rocky Mountain Botany. By John M. Coulter, Ph. D., Professor of Botany in Wabash College. Ivison, Blakeman, Taylor & Co. New York and Chicago, 1885. 8vo. pp. 452, and a glossary.

This volume is one of a botanical series published by the above-named firm. Of course we expected to find the press-work, paper, and binding satisfactory, and the expectation is fully met. It is, however, in some respects unfortunate that so close a conformity to a style adopted years ago was adhered to.

It is to be hoped that we shall have a complete flora of North America from the master, who has so long had this great task before him. The continued influx of new species must make his labor appear like the hopes of Tantalus. A volume containing all our known species requires to be supplemented almost as soon as the printer's ink is dry.

To-day, no single book, or series of books, can be designated as the Flora of North America. It must be years before any such can be produced. It was a graceful thing on the part of Professor Gray to suggest the preparation of this Rocky Mountain Manual to Professor Coulter. *Truly it meets a want*; and will leave the dwellers in the region between the 100th meridian and the western slope of the Rocky Mountains, on one hand, and between the latitudes of Southern Colorado and British Possessions, on the other, without excuse for remaining ignorant of their own flora.

The contents of the book might be outlined in tabular form, thus—

	Genera.	Indigenous species.	Varieties.	Introduced species.	Species likely to be found.
Polypetalæ.....38 Orders	184	613	59	11	4
Gamopetalæ .....23 "	181	662	149	9	?
Apetalæ.....14 "	49	166	26	3	1
Total Dicotyledons.....75 Orders	414	1441	234	23	5
Monocotyledons.....13 "	104	344	49	7	7
Gymnosperms..... 2 "	6	16	6	0	?
Vascular Cryptogams.. 7 "	19	44	3	0	2
Total.....97 "	543	1845	292	30	14

The 30 introduced species are divided among 11 genera. These added to the 543, would bring the entire number of genera up to 554.

Approximately, we may estimate the area covered by this manual at 460,000 square miles. When we remember that Chester county, in Pennsylvania, with but 738 square miles, has an indigenous flora of nearly 1,200 species, it serves to bring out strongly how little, even in favored regions, mere area has to do with the number of specific forms a flora may contain. Another interesting fact as bearing upon introduction of plants is, that while Chester county has probably not less than 200 introduced species which have obtained a hold, Professor Coulter's region, vast as it is, has has thus far but 30. These figures may be useful in future as showing relation of increase to time and commercial avenues, though being mostly more or less vile weeds, the west can certainly desire no increase of the number thus brought in.

Leaving the state of Michigan from the area embraced by Gray's Manual, it will then be found that Coulter's Manual covers nearly an equal surface. Considering how widely different, in the main, these floras are, it is interesting to note, that Gray describes 85 genera and 345 species of Compositæ, while Coulter has 87 genera and 354 species. Of Orchids there are nearly four times as many species in the eastern as in the western region. Including his solitary "addendum," Coulter gives 88 species of Carex, while Gray's Manual has 151. Our region is richer both in genera and in species of Coniferæ than that of the Rocky Mountains. Touching the south-western hot belt, it is not surprising to find Professor Coulter's region so well represented in Cactaceæ. We have more genera and fewer species of Leguminosæ than the western area now considered. Of course Oxytropis and Astragalus explain this.

In area, Nevada and Utah, whose flora Mr. Watson has described, is to that of Professor Coulter's range *about* as 2 is to 5. At the date of his publication (1871), Mr. Watson enumerated in his field, west of, but adjoining the Rocky Mountain region, 1,235 species, representing 439 genera and 84 orders.

The Rocky Mountain Manual merits a much more extended notice than the space permits. It must be said, however, that it is destined to mark an educational era for that portion of our country. Two months ago there was not a single volume to be had which enabled practical botany to be taught there in the schools. Now there is one of the very best character—concise, but full enough and thoroughly reliable.

It is true that here and there one detects an oversight. Thus we find Leu-

campyx in the text and Leucocampyx in the index. The use of a single paragraph for genus and species both, when there is but one of the latter, mars the appearance of the page. Hence we do not like it. It is a deviation from plan, and slight as it is, will prove an annoyance to the teacher, who is always troubled to keep these distinctions before his pupil. It is all the worse, too, that this want of uniformity does not run throughout the volume after it was started. Compare Anaphalis with Melampodium.

Gymnospermæ are placed where they should be — after the Monocotyledons. Abolition of the Spadiceous, Petaloideous and Glumaceous Divisions in the key is good; as one is no longer called upon to apologize, before pupils, for the appearance of Juncus in the second and its absence from the third of these groups.

There is, we think, a serious oversight in failing to give an artificial key to the Tubulifloræ in Compositæ. The order is, in general, considered by students difficult, if not unapproachable, but with such a key as is found in Gray's Manual these difficulties vanish after a few lessons. True such keys do not teach affinities, but they are very likely to lead to a desire to know more about them.

Prof. Coulter deserves not only the gratitude of his botanical brethren, but also that more substantial recognition from educators which results in prompt and large sales of needed and meritorious books. The call for a new edition can only be a matter of a short time. J. T. ROTHROCK.

Zur Morphologie und Biologie der Niederen Pilzthiere (*Monadinen*), zugleich ein Beitrag zur Phytopathologie. Von Dr. W. Zopf. Veit & Co. Leipzig, 1885. 4°. pp. 45. 5 col. plates.

This is an important contribution to or rather against the monera theory. It consists of a careful and keen study of the biological changes in the life of ten species belonging to the genera Vampyrella, Protomonas, Diplophysalis, Pseudospora, Aphelidium and Gymnococcus. These are representatives of the lowest forms of the protozoa, and lie upon the debatable ground between animals and plants. Most English biologists place them in the animal kingdom, just below the amœba. Zopf has classed them with the Myxomycetes in his work on *Pilzthiere oder Schleimpilze* (see this journal, vol. x, p. 332). Hæckel set them apart in a group he called the "monera" (see his History of Creation, Studien über Monera, or Leidy's Rhizopods of N. A.). The characters and relations of the monera are very well stated by Packard in his *Zoology* (p. 18). The work before us, however, touches only incidentally upon their general relationship, dealing more especially with their morphology and biology.

The monera, according to Hæckel and subsequent writers, are characterized by the simplest organization, consisting of undifferentiated protoplasm without nuclei or vacuoles. It was Zopf's good fortune to come across a fine quantity of Vampyrella among some fresh-water algæ, and he took the occasion to test the correctness of the diagnostic characters by a critical study of their structure and changes. He first treats of *V. vorax* Cienk. A very large specimen of this readily shows a border of weakly refractive protoplasm, free of the minute granules which are abundant throughout the remainder of the individual, thus demonstrating the presence of a true ectoplasm and endoplasm, as in amœba.

The most careful examination with the best immersion lenses failed to reveal a nucleus until staining was resorted to. Brandt's method of staining living organisms was first tried, which consists in using a dilute watery solution of hæmatoxylin containing a very little alum. This brought into view a number of small round bodies, first colored pale, then a deep blue. By using other staining fluids, such as borax-carmine, alum-carmine and strong hæmatoxylin, after killing with some fixing reagent like chromic or picric acid, it was readily determined that individuals contained from one to several dozen of these bodies,

according to size. The proof that these were not pyrenoids or any protoplasmic bodies other than nuclei was demonstrated by their amœboid properties.

Close scrutiny further showed a reticulated arrangement of the protoplasm, which had also been observed by Cienkowski, Hertwig and Lesser. These investigators were unanimous in considering that it was due to numerous non-contractile vacuoles. Zopf was struck with their uniformity in size, and the fact that under the highest magnification they did not appear to change their form or size in the least, as vacuoles would be likely to do. He therefore surmised that they might be solid bodies instead of empty spaces, and upon crushing an individual found it to be so. By micro-chemical tests these were shown not to be starch, cellulin or cellulose, but paramylum.

We can only glance at the remainder of this very instructive and interesting investigation. Vampyrella vorax was found to possess several nuclei and numerous paramylum bodies; V. Spirogyræ, V. variabilis, V. pendula and Protomonas amyli each contain a nucleus and contractile vacuole, or sometimes two or three. It is therefore evident that Hæckel's monera group must either be characterized anew or these species excluded; it is even possible that what is true of these may be true of all other members of the group.

Studies upon five new closely related species are given in addition to the above, and the whole is summed up under the headings morphological, biological and systematic.

Aside from the important facts which this memoir contains it is worthy of careful examination for its explicit and suggestive methods.

NOTES AND NEWS.

DR. CHARLES E. BESSEY, Lincoln, Neb., desires to obtain dried or alcoholic specimens of various species of Cuscuta, either by purchase or exchange.

SZYSZYLOWICZ has published in Engler's *Jahrbuch* the first two parts of a paper on the systematic arrangement of the Tiliaceæ. It has not yet reached the genus Tilia which most concerns American botanists.

BENEDICT RÖZL died at Smichor, Prague, on Oct. 14 last, 61 years of age. He was an extensive collector, especially of orchids, and had traveled through the southern United States and other parts of North and South America.

THE DECEMBER NUMBER of *Queen's Microscopical Bulletin* appeared with a cover, a permanent acquisition which gives it more of a magazine appearance. Although a small journal, it contains valuable items for workers with the microscope.

THE POTATO ROT (Phytophthora) destroyed last year one-third of the crop in the State of Michigan, and a still larger proportion in New York. Michigan raises in prosperous seasons 9,000,000 bushels of potatoes. The importance of the thorough economic study of such a disease is sufficiently evident.

AT THE ANNUAL ELECTION of January 12, 1886, Mrs. E. Britton and F. J. H. Merrill were elected editors of the *Torrey Bulletin* for the coming year, to succeed Mr. W. R. Gerard. All exchanges or donations of papers or books for the club's library, are to be hereafter addressed "Torrey Botanical Club, Columbia College, New York City." Papers and notes for publication should be sent to the same address.

THE ITALIAN GOVERNMENT will open on March 2 an International Exhibition of apparatus for the application of remedies in solution, powder or mixture against animal and vegetable parasites of plants, especially the grape mildew. Prizes will be given as follows: One gold medal with $100, three silver medals with $30 each, and five bronze medals. A similar exhibition for southern France will be given February 15 to 17, under the auspices of the Central Agricultural Society of the Herault.